



*The Sample Analysis at Mars (SAM) Suite Investigation on the 2009 Mars Science Laboratory (MSL) rover will address the present and past habitability of Mars by exploring molecular and elemental chemistry relevant to life. SAM is designed to reveal **CARBON CHEMISTRY** through a search for organic compounds, **THE CHEMICAL STATE OF LIGHT ELEMENTS** other than carbon, and **ISOTOPIC TRACERS OF PLANETARY CHANGE**.*

### 3 Fundamental Questions - 5 Goals

SAM's five science goals will address 3 of the most fundamental questions about the ability of Mars to support life - past, present and future. To answer these questions SAM analyzes samples of Mars atmospheric gas and soil using a powerful suite of highly miniaturized but exceptionally sensitive analytical chemistry instruments

**Question 1: What does the inventory of carbon compounds near the surface of Mars tell us about its potential habitability?**

**Goal 1:** Survey carbon compound sources and evaluate their possible mechanism of formation and destruction

**Goal 2:** Search for organic compounds of biotic and prebiotic importance especially methane.

**Question 2: What are the chemical and isotopic states of the lighter elements in the solids and the atmosphere of Mars and what do they tell us about its potential habitability?**

**Goal 3:** Reveal the chemical and isotopic state of elements (i.e. N, H, O, S and others) that are important for life as we know it.

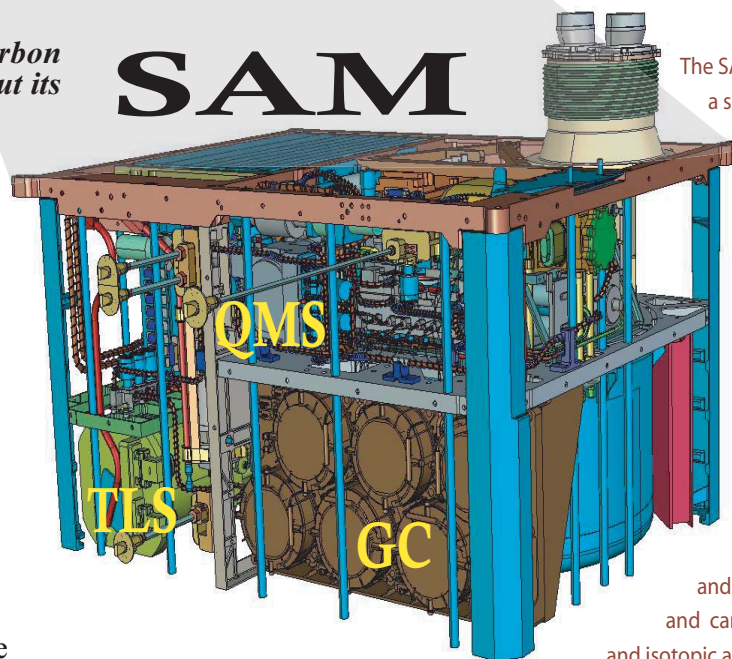
**Goal 4:** Evaluate the habitability of Mars by studying its atmospheric chemistry and the composition of trace species that are evidence of interactions between the atmosphere and soil.

**Question 3: Were past habitability conditions different from today's?**

**Goal 5:** Understand atmospheric and climatic evolution through measurements of noble gas and light element isotopes.

### Relationship to Mars Science Goals

SAM directly and definitively addresses the MSL goal of assessing the habitability of Mars. This goal is a vital step toward the overarching goal of searching for past and present life on Mars, as defined in NASA's Strategic Plan, in studies by the Mars Exploration Program Analysis Group (MEPAG) and by the National Academy of Sciences.

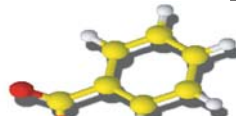


The SAM Suite occupies a substantial portion of the available volume in the Analytical Lab of the Mars Science Laboratory and addresses key science objectives of this mission. SAM samples both Mars surface samples and atmospheric gas and carries out chemical and isotopic analysis in a highly miniaturized but robust analytical laboratory

### Suite Instruments

1. Quadrupole Mass Spectrometer (QMS)
2. Gas Chromatograph (GC)
3. Tunable Laser Spectrometer (TLS)

Follow the Water



Find the Carbon

**HABITABILITY**

Interrogate the Isotopes

